

Vehicle Communications System

Background of the Invention

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The present invention relates to communications systems in vehicles such as taxis. More particularly, although not exclusively, the invention relates to a taxi network communications system encompassing vehicle-top advertising,
10 voice communications, fleet management and security systems.

In densely populated cities like Hong Kong, people spend hours on public transport and in taxis. Whilst this might be considered non-productive transit time, it represents
15 marketing opportunities to the public transport operators and taxi operators.

Pedestrians might generally regard the vast number of taxis in heavily populated cities as burdensome obstacles.
20 Nonetheless, pedestrians must watch the taxis in order to negotiate them. Again, this represents and indeed has been exploited in taxi-mounted advertising opportunities to the taxi operators.

25 Traditionally, taxi drivers obtain traffic news for example via radio broadcasts or via a two-way radio communication from the taxi base. However, such radio broadcasts are not local area-specific and are intended to be received right across the city. Accordingly, drivers receive much more information than

is necessary and sometimes no local area-specific useful information.

Objects of the Invention

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It is an object of the present invention to exploit new technologies such as but not limited to LCD (Liquid Crystal Display) panels, GSM (Global System for Mobile Communication), GPRS (General Packet Radio Services), SMS (Short Message Service), GPS (Global Positioning System) and VOIP (Voice Over Internet Protocol) technologies in a wireless communications/advertising system for vehicles.

15 It is a further object of the present invention to provide a wireless communications system for vehicles in a broad area in which only those vehicles within a local subset area of the broad area receive information from a central server relevant to their local area.

20 It is further object of the present invention to provide a visual display panel upon taxis within a network of taxis for displaying single taxi-specific information transmitted thereto via a wireless network.

Disclosure of the Invention

There is disclosed herein a vehicle based content display system implemented in a broad area comprising subsets of local areas cells, comprising:

a plurality of vehicles randomly mobile throughout the broad area and having an outdoor content display panel for displaying location-based advertisements and instant information,

processing means located in the vehicles for controlling content including advertising on the display panels based on the vehicles' location,

a control centre for receiving and processing instant information including data identifying target vehicles in a particular said cell, and

processing/transmission means for wirelessly transmitting said instant information to only those vehicles in said particular cell for display on the display panel immediately

Preferably, the vehicles are in wireless communication with the control centre via an IP-based wireless data network.

Preferably, the IP-based wireless data network uses a mobile data service protocol.

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Preferably, the mobile data service is a General Packet Radio Services (GPRS) or 3rd Generation (3G) mobile service.

Preferably, the IP-based wireless data network includes peer-

to-peer communications between vehicles.

Preferably, the system includes a method of delayed
downloading of content to each vehicle comprising downloading
5 from the control centre to a first vehicle a file containing
the content, and transferring the file to other vehicles using
the peer-to-peer communications between vehicles.

Further aspects of the invention will become apparent from the
10 following description which is give by way of example only.

Brief Description of the Drawings

A preferred form of the present invention will now be
15 described by way of example with reference to the
accompanying drawings, wherein:

Fig. 1 is a schematic overview diagram depicting an
embodiment of the invention, and
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Figs. 2 to 8 are schematic diagrams illustrating a network
structure of embodiments of the invention.

Description of the Preferred Embodiments

25 In Fig. 1 of the accompanying drawings there is depicted
schematically an overview diagram of an intelligent vehicle
system in which a content display system comprises an outdoor
content LCD display panel installed outside a vehicle - say

rooftop mounted. It can display to pedestrians information including news, traffic reports, stock prices and more. Displayed information can be text, graphics and animations for example and advertising could be displayed.

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The indoor content display for passenger-viewing might comprise a back-of-headrest LCD display panel for displaying different types of information to passengers en route. Information could include news, movie trailers or comprise
10 interactive games for example.

The voice communication system comprises inter-driver communications. For example, with newly introduced VOIP technology, drivers can communicate with one another
15 simultaneously through the existing wireless IP network. The system is integrated with voice recognition functionality so drivers can control the system using voice commands.

For server communication, drivers can communicate with the
20 central server using voice commands directly. The central server would act like a human operator to answer requests from drivers and provide assistance when necessary.

An information auto-broadcast feature comprises GPS
25 technology in which information including road conditions, car accidents and passenger location and be tailor-made and sent to each driver individually. Drivers can listen to this information.

The Fleet management system includes vehicle real-time monitoring and control. With the positioning system installed in each vehicle unit, vehicle location data is collected and transmitted to the central server in real time.

5 Users can monitor the vehicle location upon terminals on a map interface. Vehicle status information including fuel consumption, battery life and door open/close status can be monitored and transmitted to the central server for processing.

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The vehicle security systems might include a theft alarm in which sensors are installed inside the vehicle body to detect unauthorised access. In the case of detection of an unauthorised entry, information is transmitted to the central
15 server immediately and the central server could be set up to transmit a police communication.

An SOS alarm system might include a panic button installed inside each vehicle. In case of a vehicle hijacking for
20 example, the driver can press the panic button to enable the SOS alarm system to send an alert to the central server. An operator can listen to the situation by use of the voice communications system.

25 With reference to Fig. 2, the wireless data network comprises the core part of the network. This IP-based data network is responsible for communicating data between vehicle and server and from vehicle to vehicle. This network is used to transmit different types of data including voice, text,

graphics and animations for example.

The central server can be further divided into several components according to required functionality. For example,
5 there might be a separate communications server, display content server, fleet management server and web server.

The terminals allow users to control the system by connecting to the central server. The terminals might be locally based
10 at the control centre, or be connected via the Internet.

The vehicles would typically be taxis or buses driven upon public roads in a large city. For example, a small
"intelligent box" would be installed in each vehicle and
15 integrated with the various functions and installed in or upon the vehicle. These include wireless communications systems, data storage, positioning systems, vehicle sensors and indoor/outdoor display panel controls etc.

20 Some typical application scenarios will now be described.

Fig. 3 depicts a taxi on-call scenario in which a passenger in Region A calls into the operator to request a taxi. The operator uses the "Fleet Management System" to select
25 available taxis nearby and on the road immediately. The operator then broadcasts this new job to all the selected taxis using the location-based broadcast of the "Voice Communication System" and the voice channels of all selected taxis are opened to await reply. One of the drivers picks up

the job by replying to the operator through the multi-connected voice channel. The operator replies to the passenger that the booking is confirmed and advises of an estimated arrival time. When the taxi has arrived, the passenger can identify the taxi by a display upon its external display panel - for example "Mr Wong please".

By use of the location information in the "Fleet Management System", the operator knows the position of each vehicle immediately and therefore the vehicle-finding time is shortened.

Unnecessary voice interruption is avoided. By use of the location-based voice broadcast, only the selected drivers who are located for the particular job receive the voice message.

Inappropriate drivers are unaware of the job as they are not advised of it. This minimises voice channel pollution - keeping it "clean" and unwanted drivers are not unnecessarily burdened by voice communications.

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Customer service is personalised by means of the vehicle-top display panel showing the customer's identity (if requested).

This would also prevent the possibility of arguments arising between the correct passenger and any would-be passenger for whom the taxi was not called.

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Fig. 4 serves to describe a location-based content display platform. In this scenario, the concept location-based content display is introduced. Using the roof-top display

panel, content such as government announcements and advertisements can be displayed based on the vehicle's location. For example, in national park areas, safety-specific hiking information could be displayed.

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In one scenario, a car accident might have just occurred in Region A resulting in a traffic jam on the road nearby over the next several hours. A government representative might have access to the system via a terminal. Time slots can be acquired from the system of vehicles in Region A and Region B.

The representative can instruct the vehicles in Region A to display a "path of escape" message and instruct vehicles in Region B to display an "Avoid Region A" message. After instruction is received, the server can determine the target vehicles and send the appropriate data for display immediately.

An advantage of the above instant content download system is that messages can be broadcast to the target region immediately. Messages can be updated from time to time, so as to keep the information-flow current.

Location-based messages could be sent to different regions at the same time. Accordingly, traffic in different regions can be controlled separately and simultaneously.

In another scenario, promotional material can be displayed. For example, there might be an exhibition held in Region A. An advertising company might attract more instant

participants by promoting the exhibition upon the rooftops of taxis in Region A. After instruction is received, the server can determine the target vehicles and send data to those vehicles only.

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An advantage of the above scenario is in cost-effective advertising. That is, the marketing people are targeting impulsive attendees who happen to be in the area to fill say the last available seats at an event at a discount price and
10 need not spend more money on broad ranging advertising.

An anti-hijack system is depicted in Fig. 5. In this scenario, unlucky Vehicle A is hijacked. Driver A has pressed the panic button and an SOS signal is transmitted to
15 the central server immediately. A voice communication channel is then opened with the server so that the dialog inside the vehicle can be recorded by the server. An SOS message is displayed on the roof-top panel to attract nearby pedestrian attention. The operator at the monitoring station
20 who receives the SOS signal can listen to the dialog received via the voice channel. At the same time, the vehicle location is monitored and a report is made to the police. Upon receiving the hijack report, police can connected to the intelligent system via the Internet and monitor the vehicle
25 while other police are dispatched to the location.

The wireless network communication network is the core component of the system. Sufficient bandwidth for the transmission of text, voice, graphics and movie clips is

achieved in an economical manner using a "hybrid approach". For example, a centralised network topology could be deployed of low to medium bandwidth (say 300 Kps) in which all nodes are connected to the central server. This topology would
5 always be online and provide a high range of coverage. This would be supplemented by peer-to-peer network topology of high bandwidth (say 10 Mps). This would be an ad hoc network available only when there is another node or nodes found nearby. The effective range of this topology might be only
10 several hundred metres.

Fig. 6 depicts an integration of the two network topologies. The dotted lines represent the central network while the solid lines represent the peer-to-peer network. Different
15 applications of the system could avoid either or both network - depending on the required bandwidth, transmission speed and maximum delay allowed.

The control signal communication involves sending signals
20 between the vehicle units and the server - mainly for monitoring and management purposes. The centralised network would be the suitable choice for this type of data transmission.

25 With VOIP technology, voice can transmit over packet networks, with better utilisation of network resources. The "always-on" feature would be a key element for voice communications. Moreover, voice communication would be built mainly around the "centralised network" topology. However, voice

communication could benefit from the peer-to-peer network to a certain extent. For example, in crowded cities like Hong Kong, it is not difficult to locate the node of a neighbour and the central server will be adapted to
5 accommodate/compensate for this.

In performing news broadcasts to a specific region, instead of establishing a connection to all the nodes, the central server first selects some of the nodes as primary nodes.
10 Connections are established with these primary nodes. In the next stage, these primary nodes further establish connections with nearby nodes. As a result, all the nodes in a particular region are connected as a network and broadcast begins.

15 It should be appreciated that the vehicle nodes are not fixed in location as the vehicles move during broadcasts. As such a vehicle using peer-to-peer connection may move out of range from a primary node resulting in transmission loss. For this
20 reason, the node itself can incorporate intelligence to anticipate a lost connection and thereby switch connection mode accordingly. Two options are available here. Switching can revert to another primary node nearby if one can be found.
If this fails, a connection can be made to the central
25 server.

In Fig. 7 a news broadcasts is made to Regions A, B and C respectively. The central server first selects some of the nodes as primary nodes. For example, Nodes 1 and 2 are

selected in Region A. Connections are established with those nodes as indicated by the dotted lines. These nodes then find nearby nodes. For example Node 1 finds Nodes 5 and 6. Node 6 further finds Node 7 and connections are established.

5 After all the nodes in a region are connected, the broadcast can begin. In using this approach, the workload of the centralised network server is reduced, while still maintaining a real time transmission.

10 File transfer is required when the central server needs to update the graphic or animation contents to be displayed upon the vehicles. Typical data size would be high (say 10 Mb 100 Mb). Download to each vehicle might not be required immediately. Probably a half to one day delay would be
15 acceptable, so peer-to-peer network transmission would be applicable in this situation.

In Fig. 8, access points AP are connected to the central server via a wired network. File transfer starts when a
20 vehicle node enters into the effective region of the AP. In the figure, Node 4 enters the effective region of AP 1. As a result, the file is transferred to Node 4. With the benefit of the high-speed peer-to-peer network (say 10 Mbps, the file can be transferred rapidly. In the next step, Node 4 would
25 transfer the files to vehicles within the neighbourhood.

It should be appreciated that modifications and alterations obvious to those skilled in the art are not to be considered as beyond the scope of the present invention.

CLAIMS:

1. A vehicle based content display system implemented in a broad area comprising subsets of local areas cells, comprising:

5 a plurality of vehicles randomly mobile throughout the broad area and having an outdoor content display panel for displaying location-based advertisements and instant information,

processing means located in the vehicles for controlling
10 content including advertising on the display panels based on the vehicles' location,

a control centre for receiving and processing instant information including data identifying target vehicles in a particular said cell, and

15 processing/transmission means for wirelessly transmitting said instant information to only those vehicles in said particular cell for display on the display panel immediately.

2. The system of claim 1 wherein the vehicles are in
20 wireless communication with the control centre via an IP-based wireless data network.

3. The system of claim 2 wherein the IP-based wireless data network uses a mobile data service protocol.

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4. The system of claim 3 wherein the mobile data service is a General Packet Radio Services (GPRS) or 3rd Generation (3G) mobile service.

5. The system of any one of claims 2 to 4 wherein the IP-based wireless data network includes peer-to-peer communications between vehicles.

5 6. The system of claim an preceding claim including a method of delayed downloading of content to each vehicle comprising downloading from the control centre to a first vehicle a file containing the content, and transferring the file to other
10 vehicles.

7. A vehicle based content display system as herein described with reference to any one of Figures 1 to 8.

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